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Bourang et al.

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(54) **CATHETER MANAGEMENT DEVICE**

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A61M 25/02 (2006.01)
A61M 25/01 (2006.01)

(52) **U.S. Cl.**
CPC ***A61M 25/02*** (2013.01); *A61M 2025/0177* (2013.01); *A61M 2025/028* (2013.01)

(58) **Field of Classification Search**
CPC A61M 25/02; A61M 2025/0177; A61M 2025/028
USPC 604/523
See application file for complete search history.

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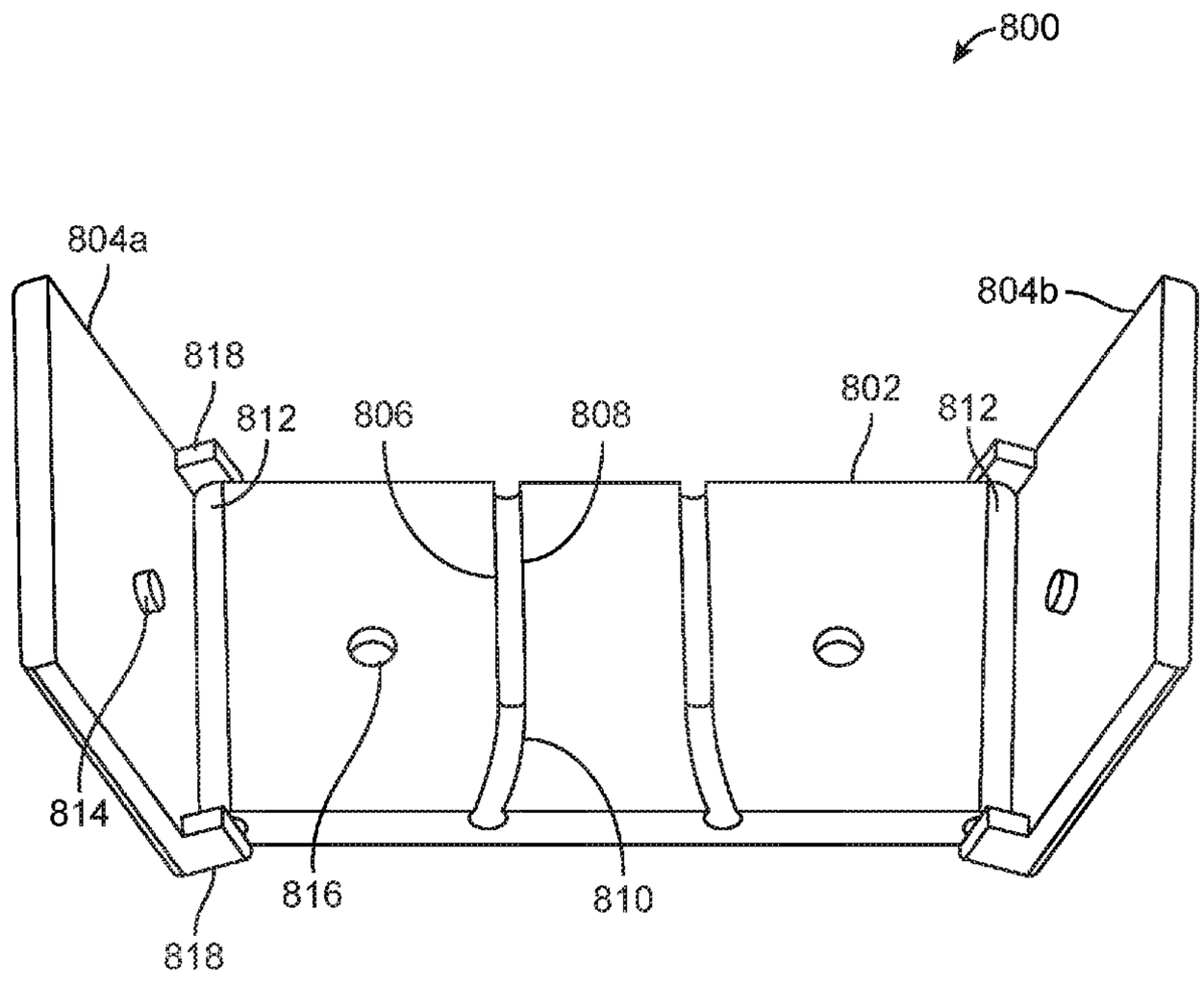
(57) **ABSTRACT**

An elongate shaft management device has an upper plate and a lower plate. The lower plate has at least one groove that is sized to receive the elongate shaft. The at least one groove in the lower plate cooperates with the upper plate to capture the elongate shaft and prevent movement of the elongate shaft. The upper plate is releasably coupled to the lower plate to provide access to the elongate shaft and allow it to be manipulated.

28 Claims, 11 Drawing Sheets



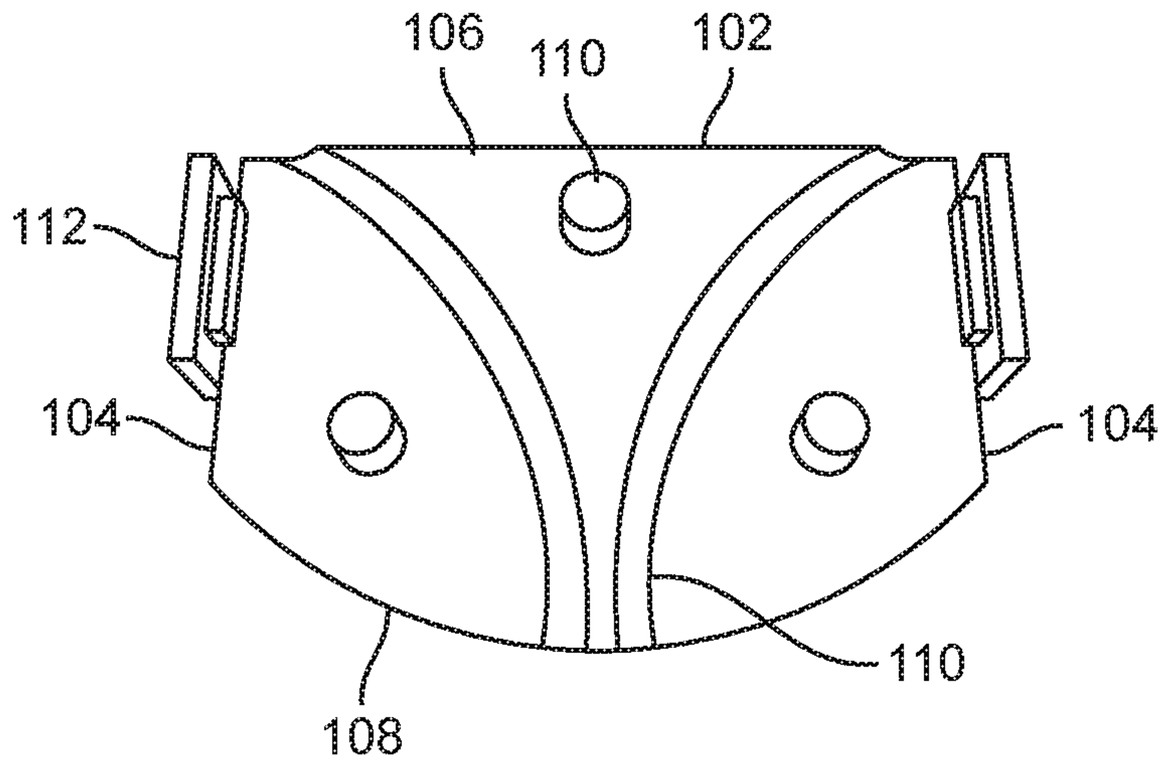


FIG. 1

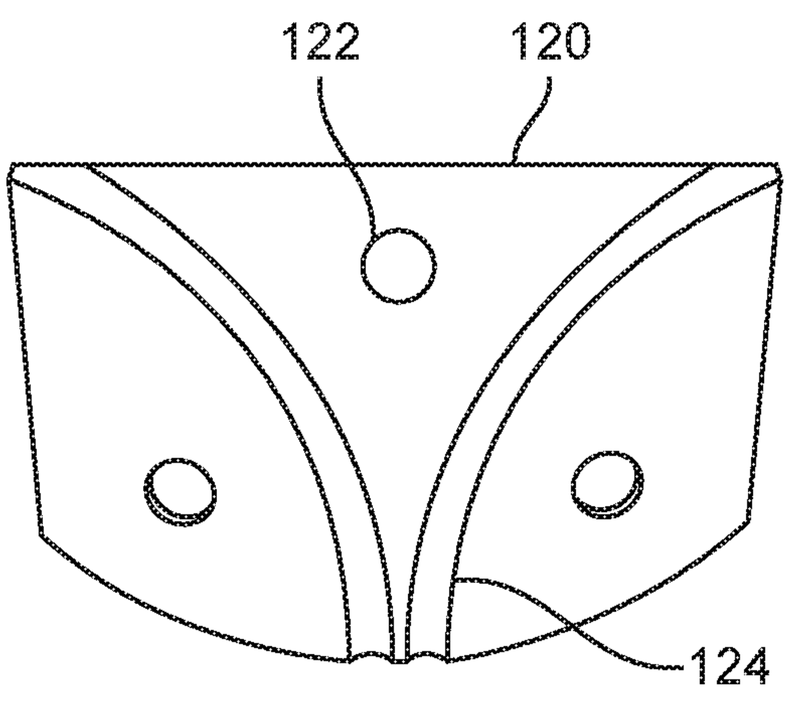


FIG. 2

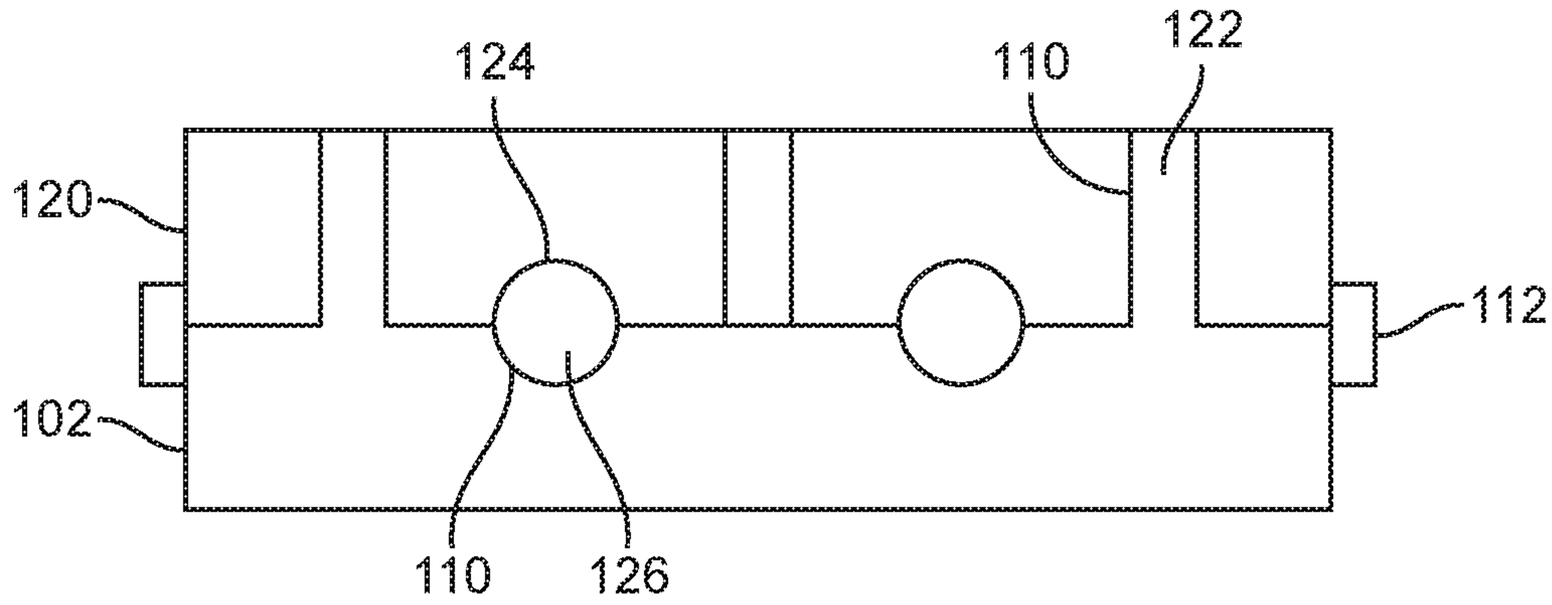

124
110
122
120
112
102
110
126

FIG. 3

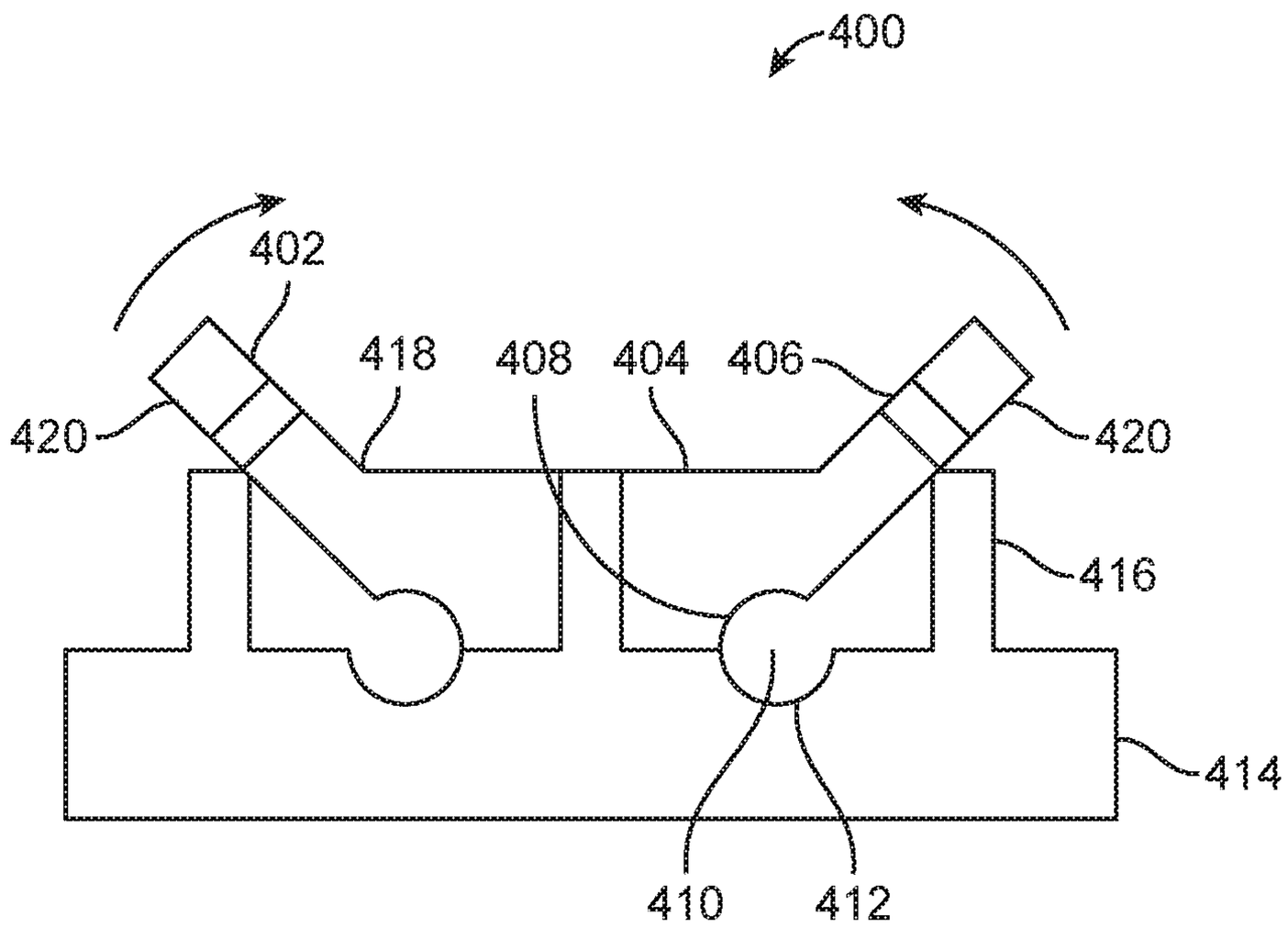

400
402
418
408
404
406
420
420
416
414
410
412

FIG. 4

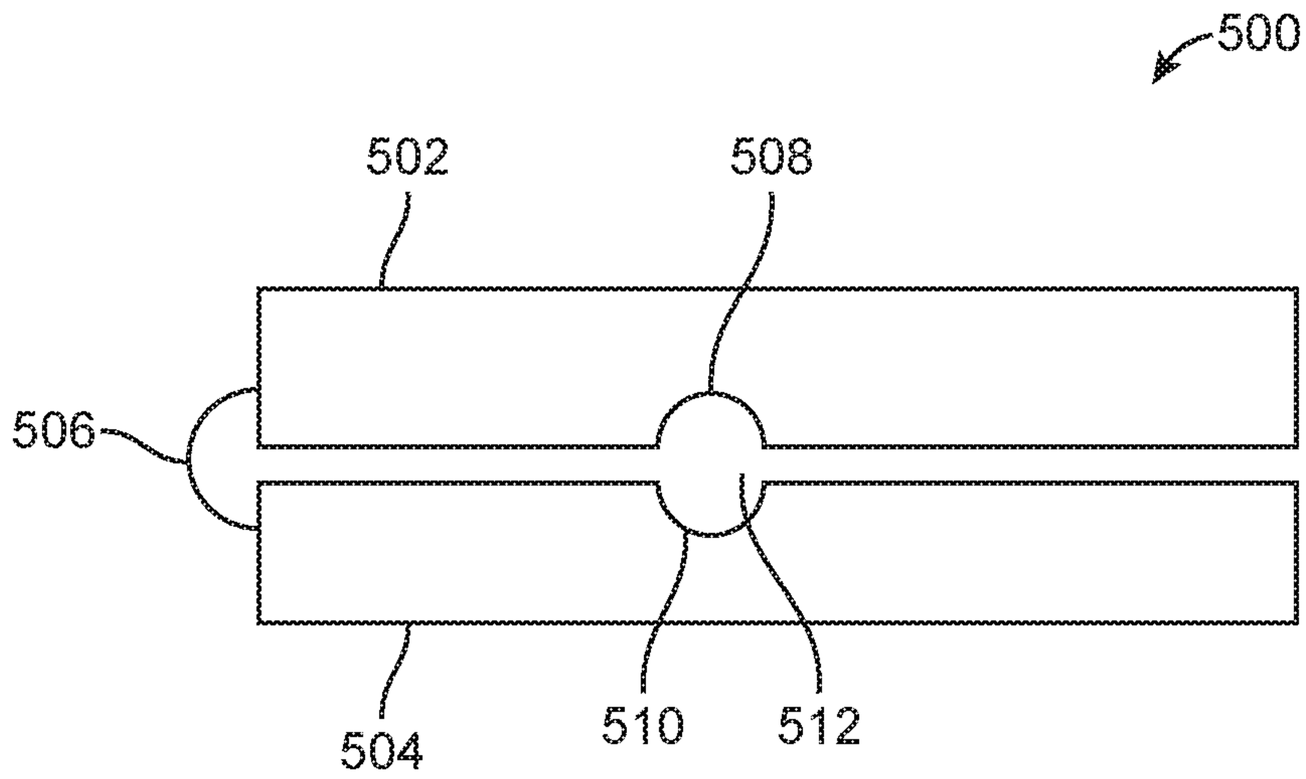


FIG. 5A

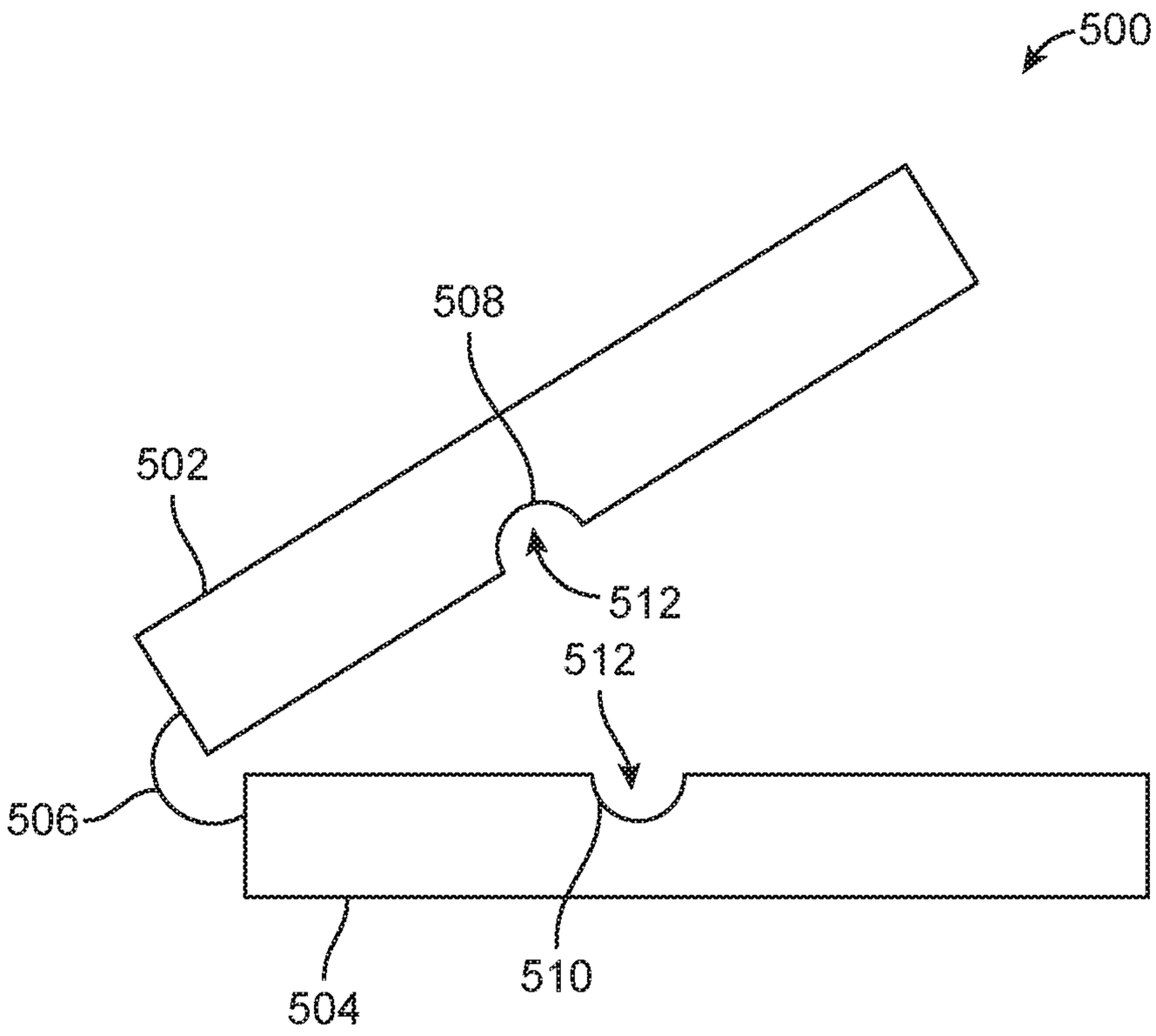


FIG. 5B

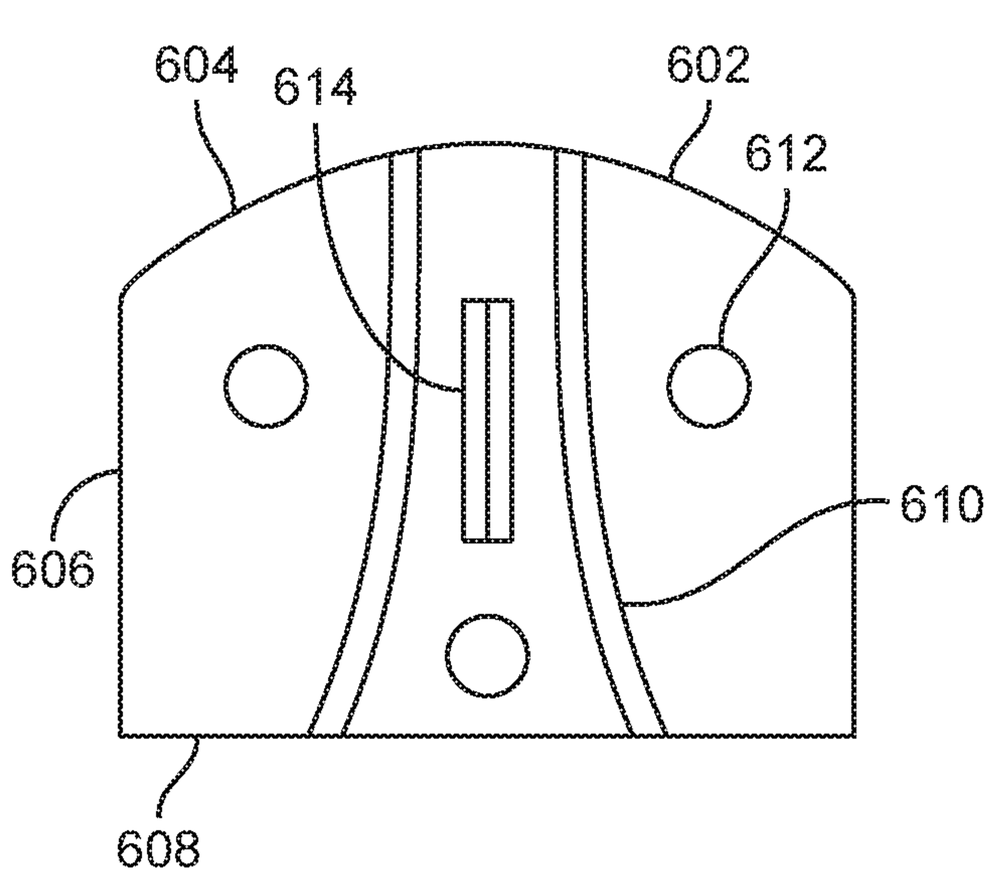


FIG. 6A

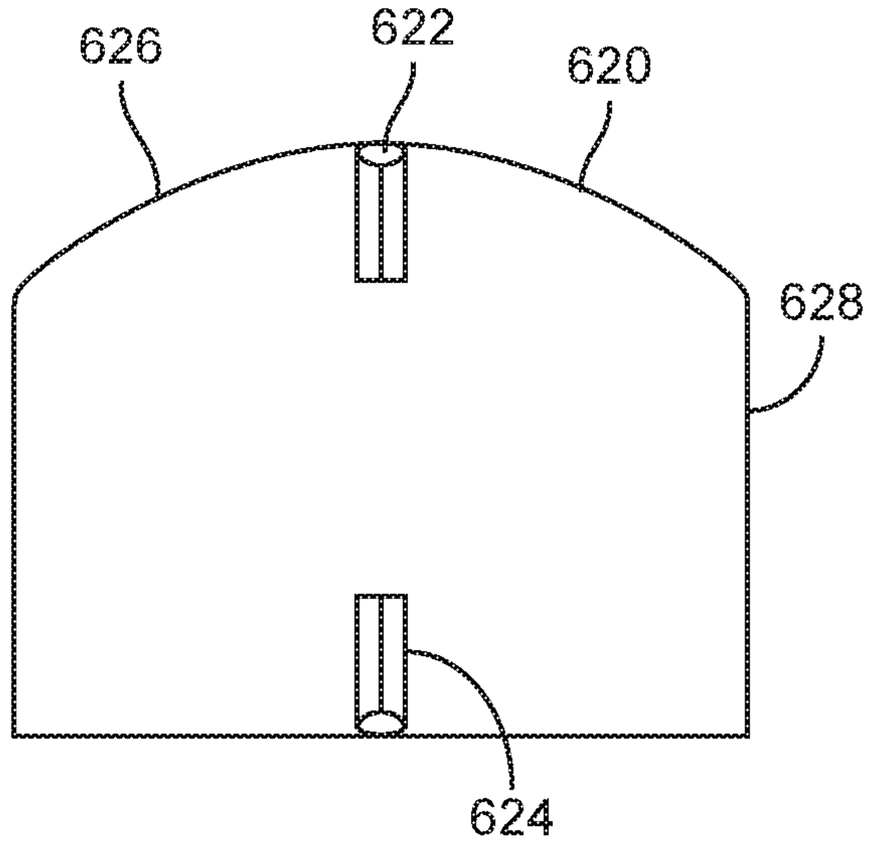


FIG. 6B

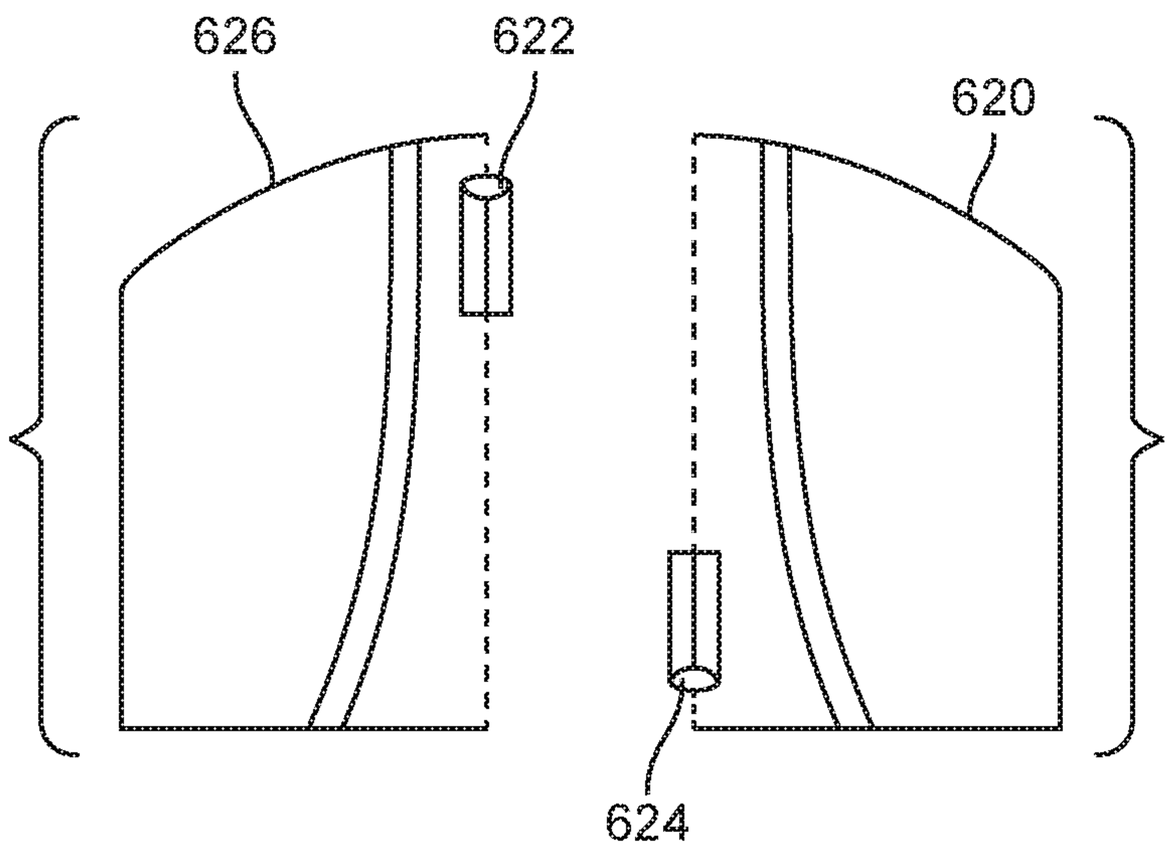


FIG. 6C

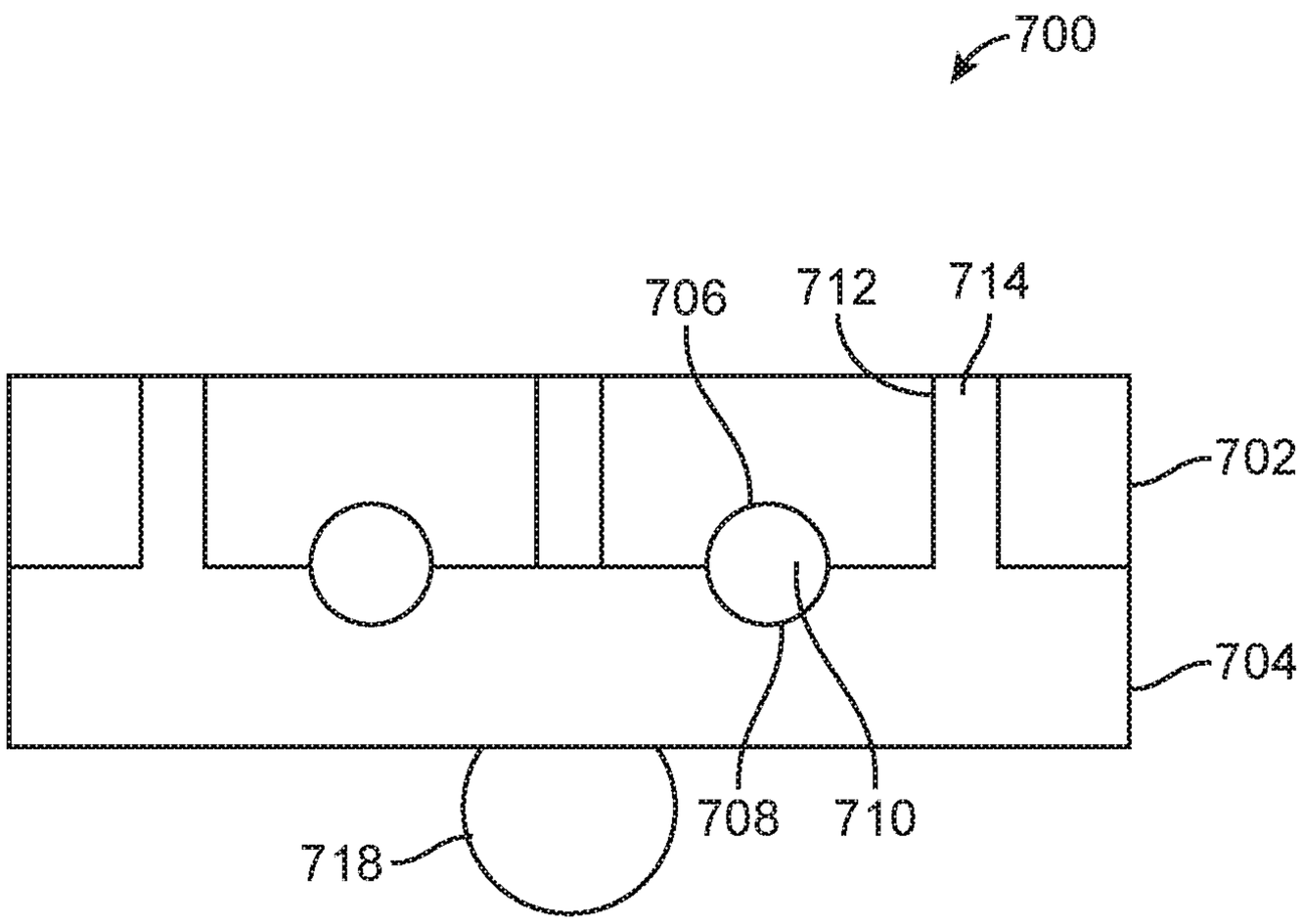

700
706
712
714
702
704
708
710
718

FIG. 7A

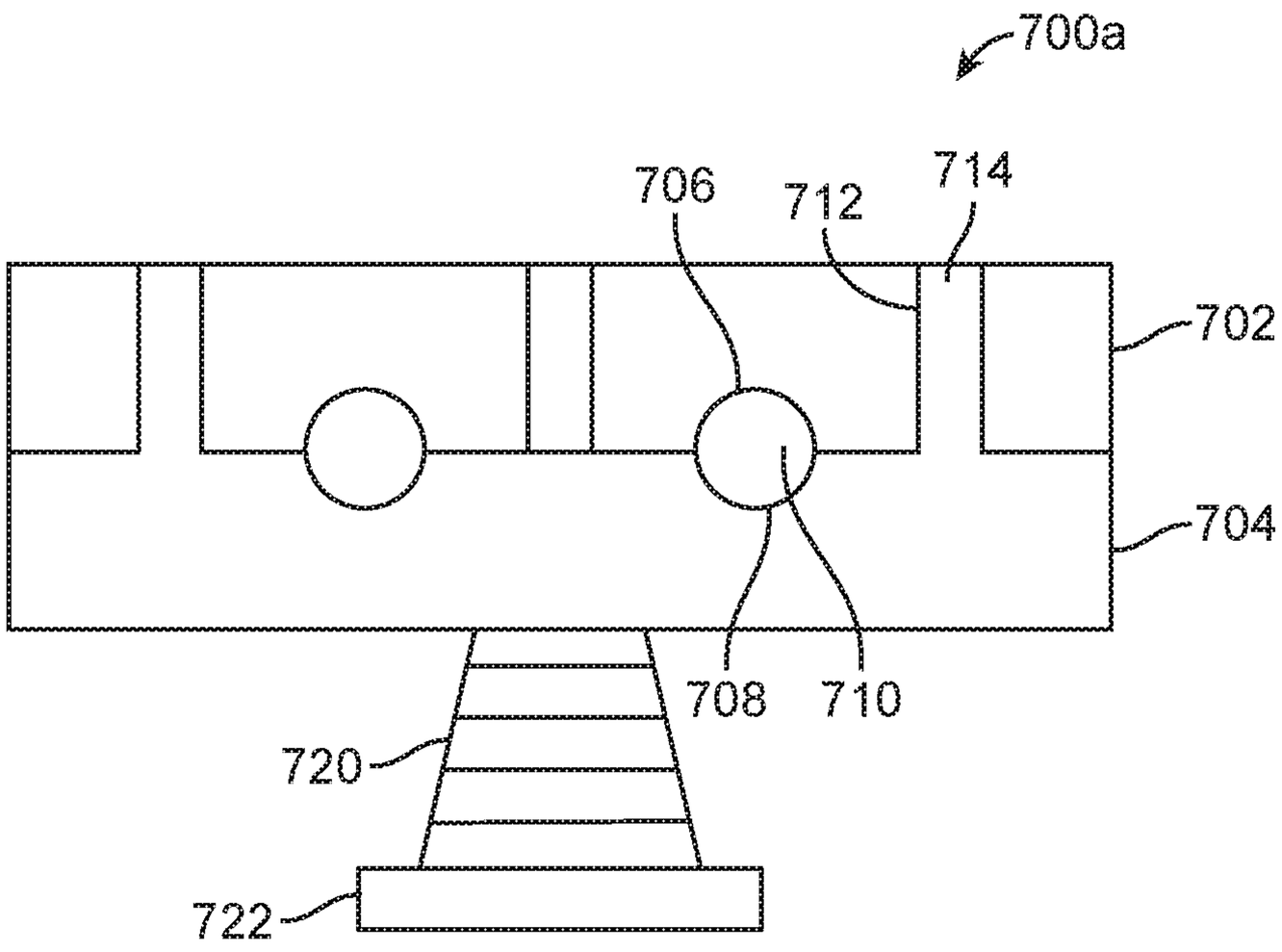

700a
706
712
714
702
704
708
710
720
722

FIG. 7B

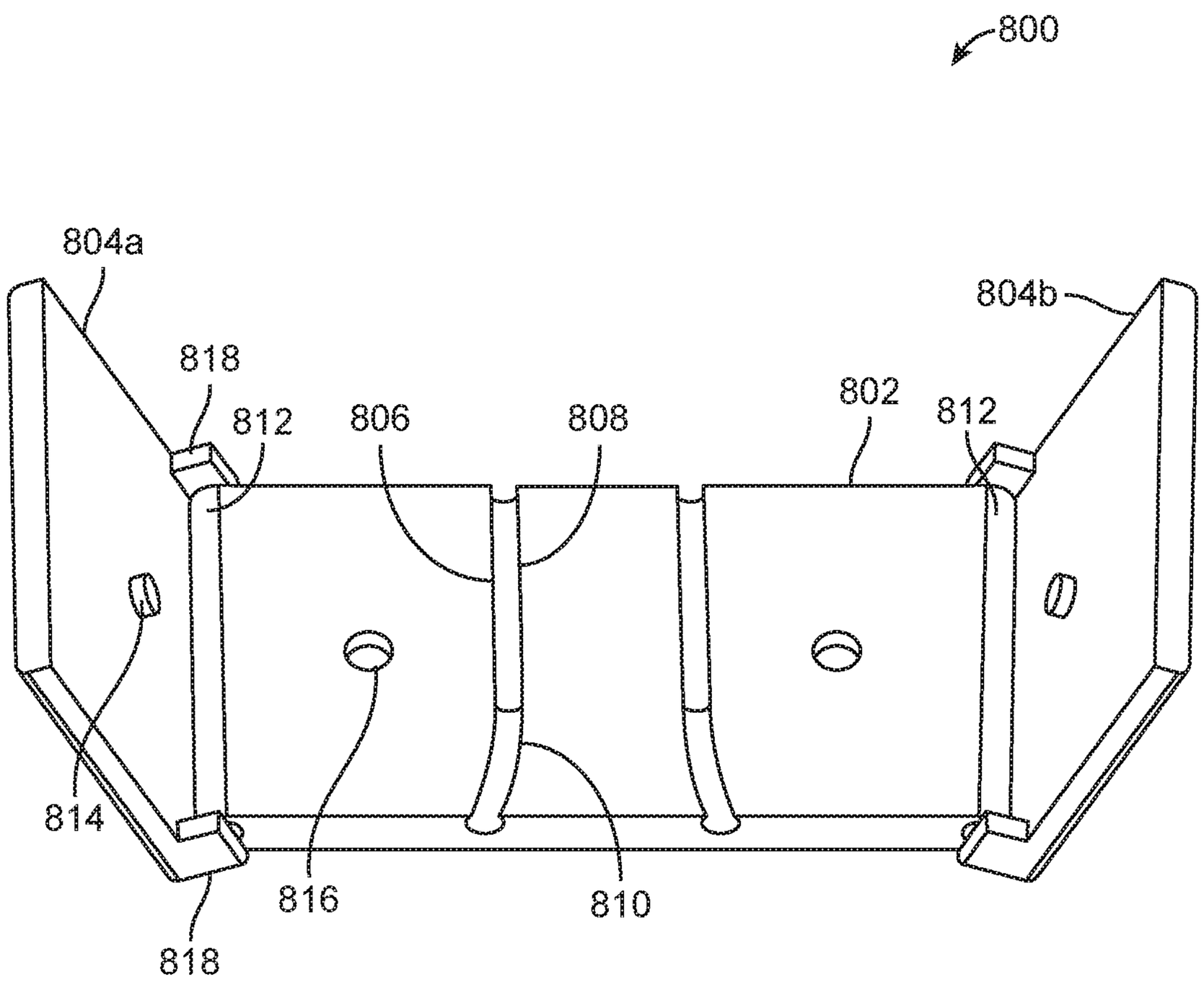


FIG. 8

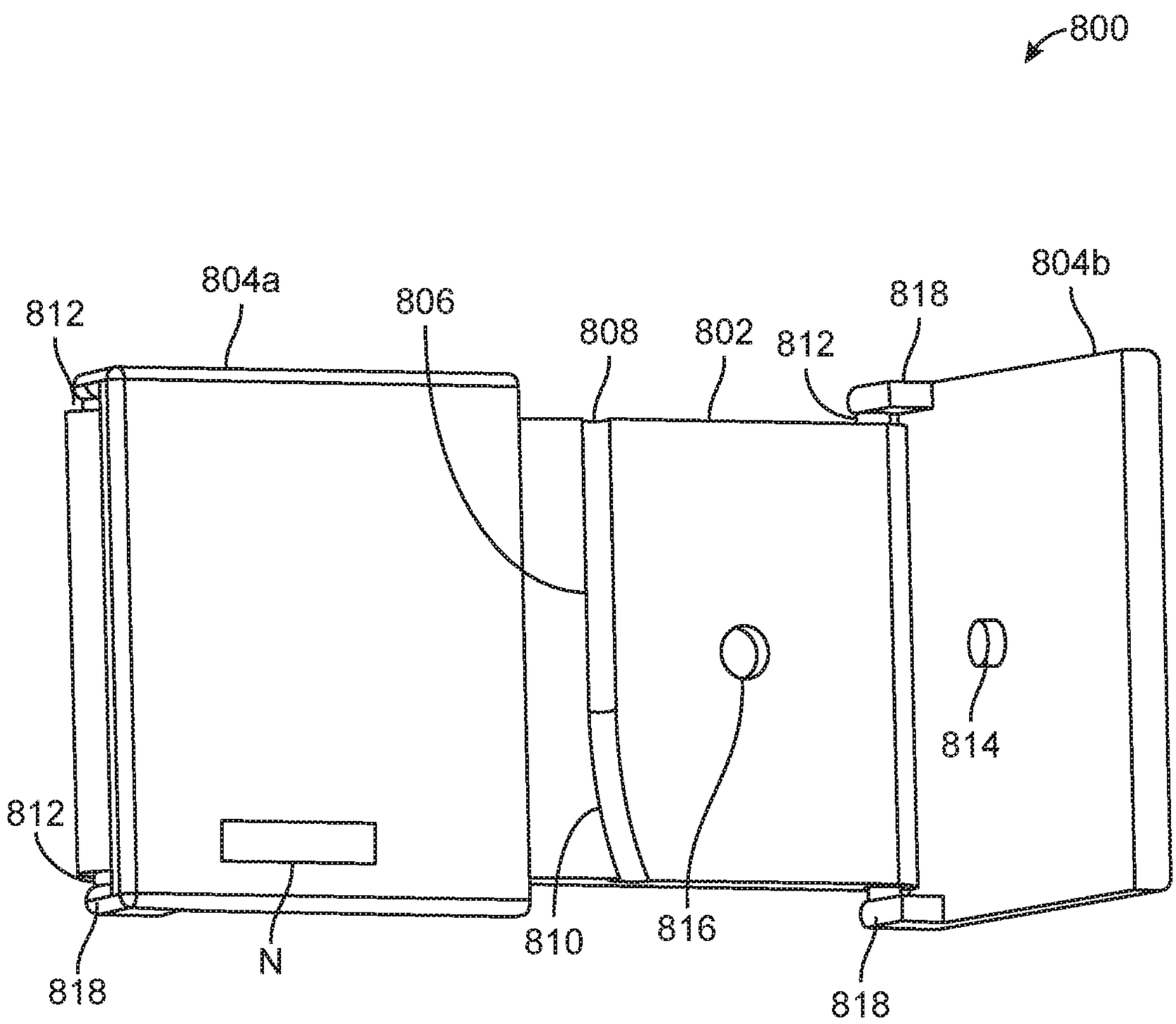

800
804a
812
806
808
802
812
818
804b
812
814
812
N
810
816
818
818

FIG. 9

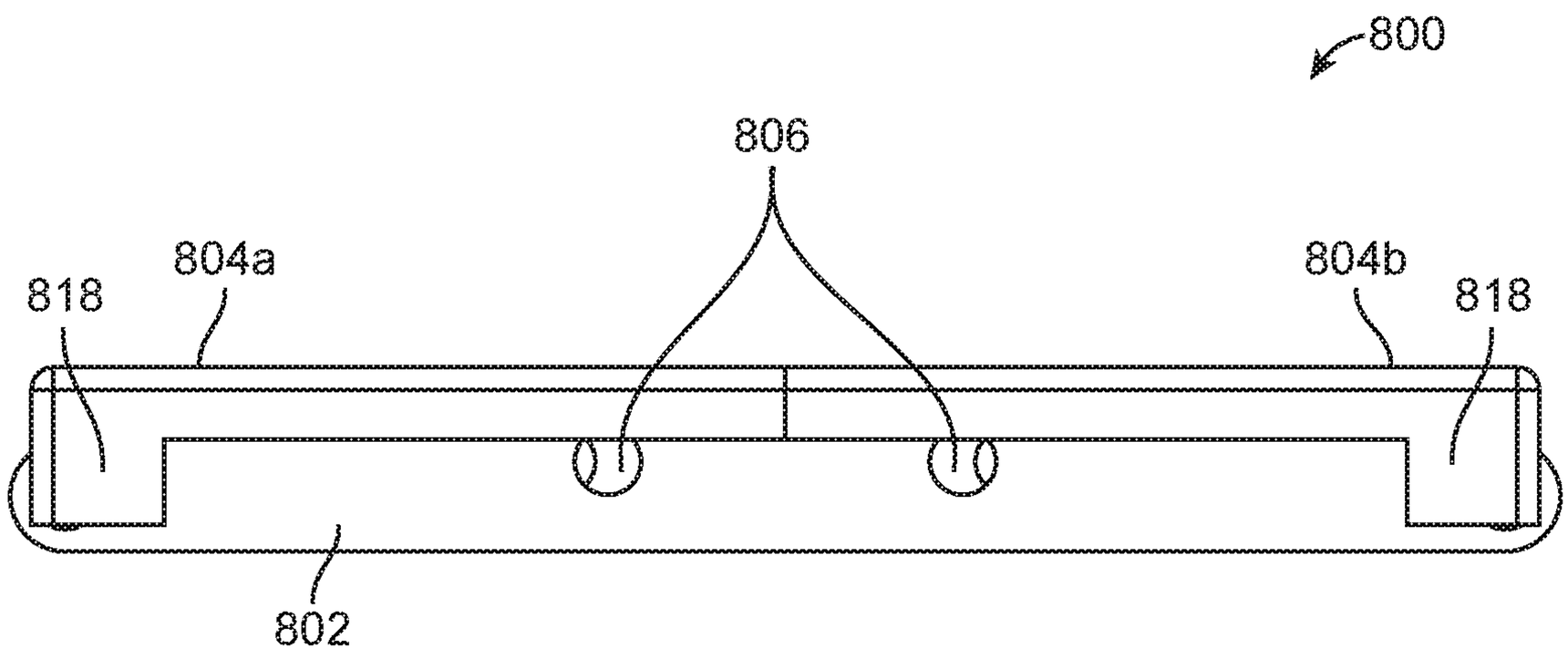


FIG. 10

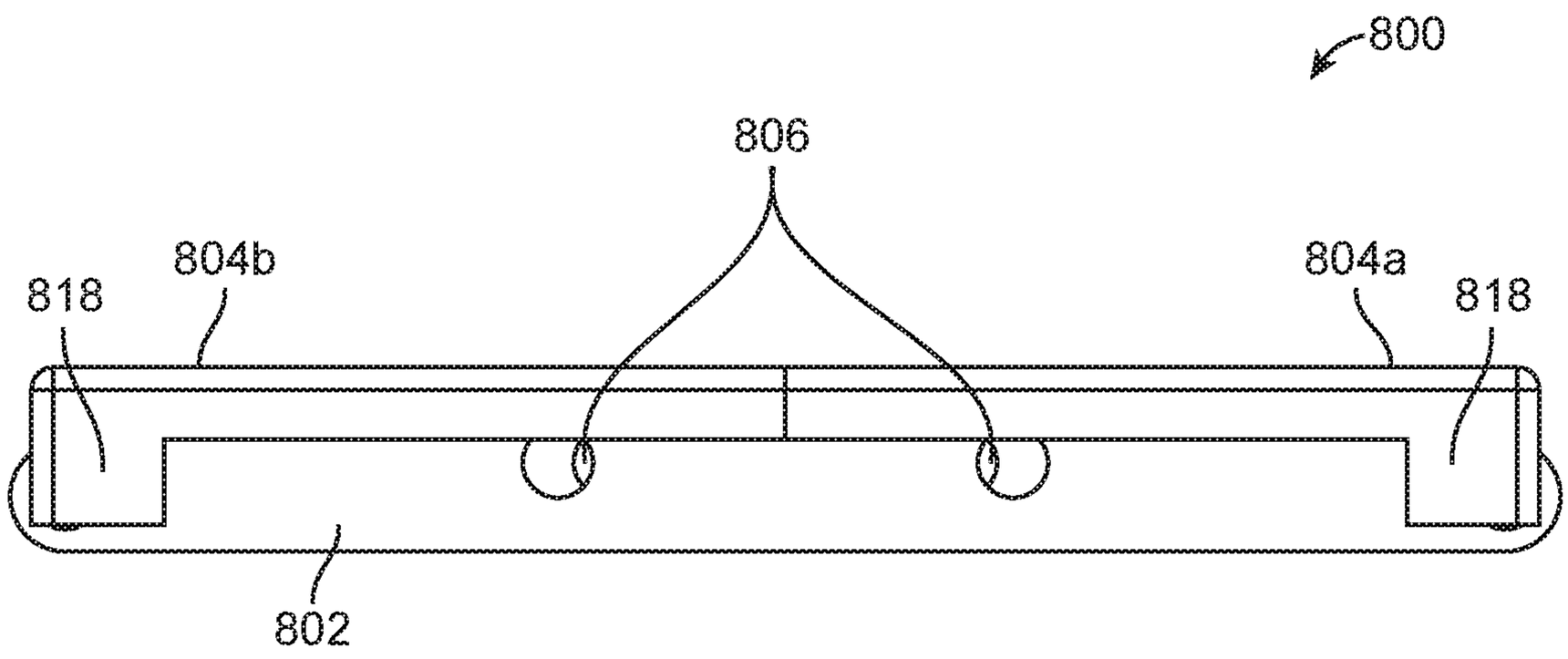


FIG. 11

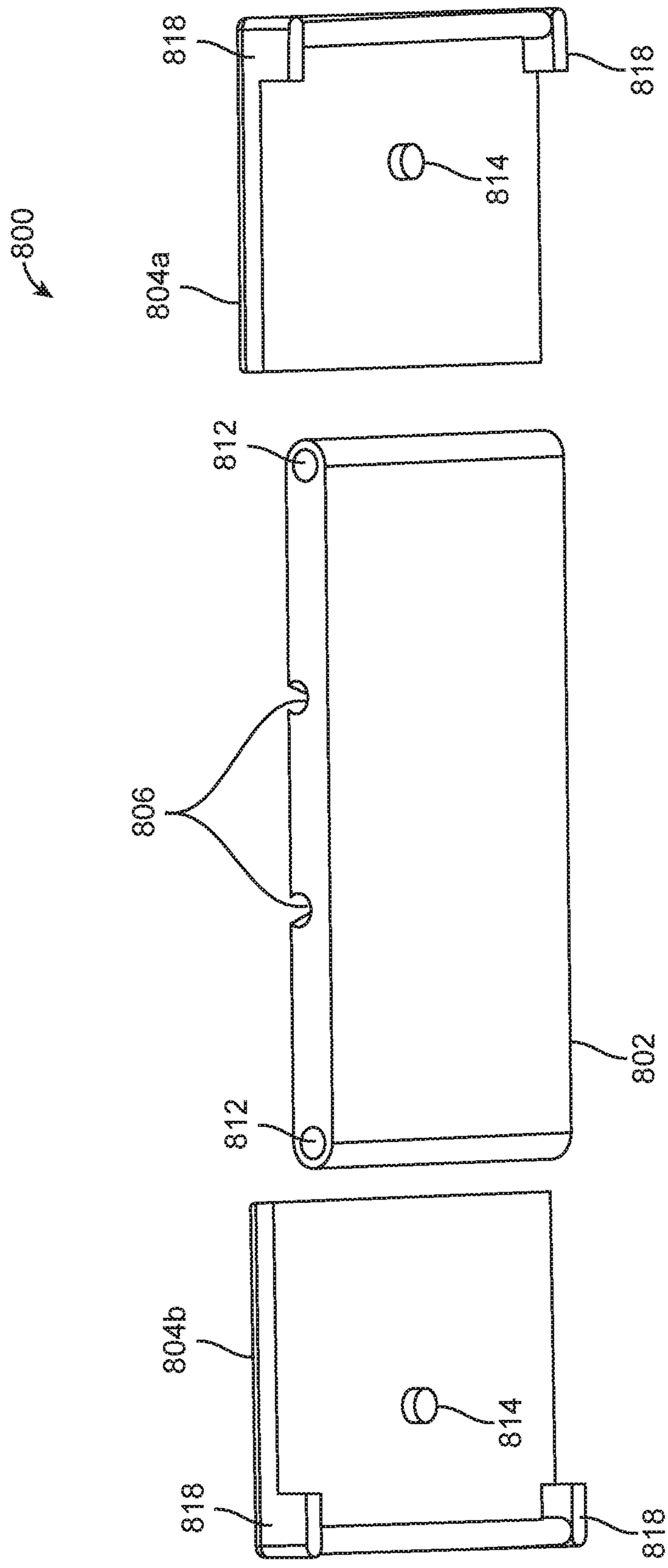


FIG. 12

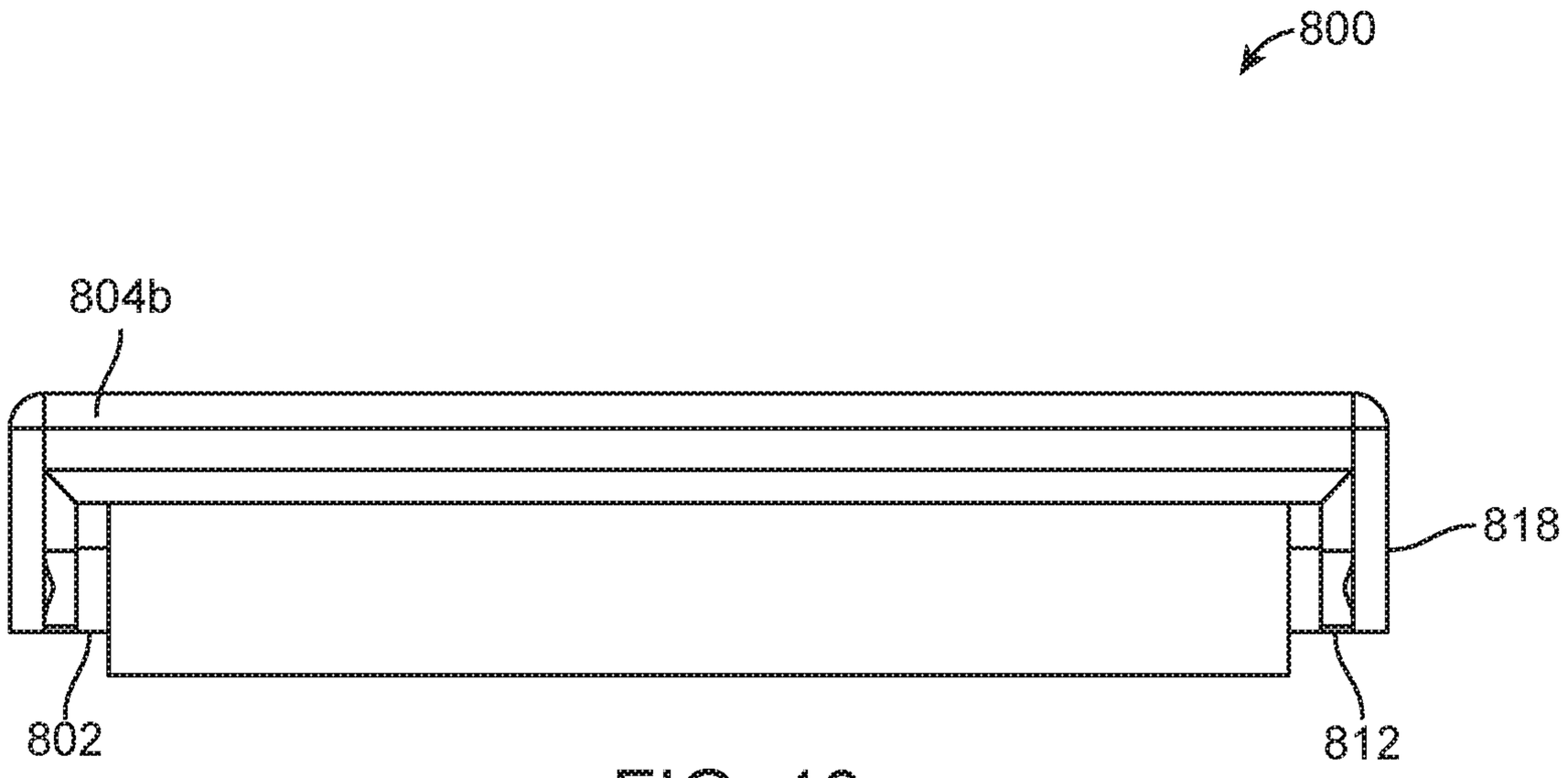


FIG. 13

CATHETER MANAGEMENT DEVICE

CLAIM OF PRIORITY

The present application is a non-provisional of, and claims the benefit of U.S. Provisional Patent Application No. 62/889,667 filed on Aug. 21, 2019; the entire contents of which are incorporated herein by reference.

BACKGROUND

Many therapeutic and diagnostic procedures are performed using catheters and/or guidewires to access target areas of the body using minimally invasive techniques. For example, blockages in the heart are treated using angioplasty catheters or stent delivery catheters thereby avoiding open heart surgery. Guidewires are often used to facilitate advancement of the diagnostic or therapeutic catheter to the target area, and often multiple catheters or multiple guidewires may be used during the procedure.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, which are not necessarily drawn to scale, like numerals may describe similar components in different views. Like numerals having different letter suffixes may represent different instances of similar components. The drawings illustrate generally, by way of example, but not by way of limitation, various embodiments discussed in the present document.

FIG. **1** shows an example of a bottom plate.

FIG. **2** shows an example of a top plate.

FIG. **3** shows the top and bottom plates from FIGS. **1-2** engaged with one another.

FIG. **4** shows a hinge element in the top plate.

FIGS. **5**A-**5**B show a top plate and bottom plate with a hinge on a lateral side.

FIGS. **6**A-**6**C illustrate an example of top plate and a bottom plate with a central hinge element.

FIG. **7**A-**7**B illustrate examples of grasping elements.

FIGS. **8-13** show another example of a catheter management device.

DETAILED DESCRIPTION

Many therapeutic and diagnostic procedures are performed using catheters and or guidewires to access target areas of the body using minimally, invasive techniques. For example, blockages in the heart are treated using angioplasty catheters or stent delivery catheters thereby avoiding open heart surgery. Guidewires are often used to facilitate advancement of the diagnostic or therapeutic catheter to the target area, and often multiple catheters and guidewires may be used during the procedure. A physician must keep track of each guidewire and catheter to ensure that they are not mixed up, and the multiple catheter shafts or guidewires must be prevented from entangling with one another so that manipulation and control of the catheters and guidewires is still possible. At least some of the examples of catheter and guidewire management devices disclosed herein will address at least some of these challenges.

FIGS. **1-3** illustrate one example of a catheter management device.

FIG. **1** illustrates an example of a bottom plate **102** that may be used in a catheter or guidewire management device. The bottom plate may be a flat planar plate of any shape. Here the plate has two linear lateral sides **104** and an arcuate distal edge **108** and a linear proximal edge **106**. The linear proximal edge **106** may be facing the operator and the arcuate distal edge **108** may be facing the patient, or the opposite orientation may be used where the linear proximal edge faces toward the patient and the arcuate edge faces toward the operator. Any number of grooves **110** may be disposed in the upper surface of the bottom plate. Here, two arcuate grooves are included such that at one end of the plate, the grooves are adjacent one another and substantially parallel with one another, and at the opposite end of the plate, the grooves diverge away from one another. However, any groove configuration may be used such as linear grooves that are parallel with one another or transverse to one another. An arcuate groove **110** may provide a smooth curve that a catheter shaft or guidewire may navigate as it is being slidably advanced through the groove. One or more pins **110**, here three, extend up from the top surface of the bottom plate and serve as alignment pins when the bottom plate is aligned with holes in a top plate as will be discussed below. Although this is not intended to be limiting, and the pins may be disposed on the top plate and the holes on the bottom plate, or a combination of pins and holes maybe on both plates. Additionally, on either lateral side, a wall **112** extends vertically away from the top surface of the plate. The walls serve as alignment elements to help align a top plate with the bottom plate **102** when the two plates are coupled together.

FIG. **2** illustrates an example of a top plate **120** which may be used with the bottom plate **102** in FIG. **1** to form a catheter or guidewire management device. Here, the top plate **120** is also a flat planar plate and has a shape that matches the bottom plate **102** shape such that when the two plates are stacked on top of one another, they form a uniform profile. However, this is not intended to be limiting, and any shape may be used. Optionally in any example, the shape may be compact enough to easily fit in an operator's hand for easy carrying and manipulation, or the device may rest on a surface. In this example, the top plate **120** includes alignment holes **122** which extend through the top plate and they are positioned to align with and cooperate with the alignment pins **110** in the bottom plate **102**. Additionally, the grooves **124**, here two, in the top plate also cooperate with the grooves **110** in the bottom plate **102** such that when opposite grooves are stacked on top of one another, they form one or more channels, here there are two channels. Each groove may be roughly half the diameter of a catheter shaft or a guidewire, although this is not intended to be limiting. In some examples the grooves may be less than half the diameter of the catheter shaft or guidewire and therefore when the two plates are coupled together they will capture the guidewire or catheter shaft in the resulting channel and due to the tight fit, this prevents axial movement of the catheter shaft or guidewire along the shaft. In other examples the groove may be larger than half the diameter of the guidewire or catheter shaft to allow slidable movement when the two plates are coupled together. In this example, the grooves are arcuate to match the grooves in the bottom plate, and similarly the grooves are adjacent one another at one end of the plate and substantially parallel with one another, and they diverge away from one another at the opposite end. The channel is sized to receive a guidewire or catheter shaft and hold it to prevent entanglement while still allowing an operator to slidably move or rotate the wire or shaft while in the management device, or when the plates in the management device are separated from one another.

The size and shape of the top **120** and bottom **102** plates may be any size or shape. Optionally in any example, the top and bottom plates may be sized and shaped to easily lit in an

operator's hand for easy holding and manipulation. The top and bottom plates may be rigid, soft, flexible, resilient or have any desired combination of material properties. The top plate, bottom plate, or grooves may include a lining of material such as Teflon to provide a low friction surface against which the catheter or guidewire may easily slide and be rotated. Oil or other lubricants may also be coated onto the top plate, bottom plate, or grooves to facilitate sliding or rotation of the guidewire or catheter in the groove.

FIG. **3** shows the top plate **120** stacked on top of the bottom plate **102** so the two plates sit flush against one another. The alignment pins **110** of the bottom plate are received in the alignment apertures **122** of the top plate. The top plate may be lifted off of the bottom plate at any time to allow access to the guidewires or catheter shafts that may be disposed in the channel **126** formed where opposite grooves **110**, **124** mate, Sidewall **112** helps align the top plate with the bottom plate and also may prevent unwanted lateral movement of the top plate relative to the bottom plane.

FIG. **4** shows an example of a catheter or guidewire management device **400** having a top plate **404** coupled to a bottom plate **414**. The top and bottom plates **404**, **414** are similar to those described previously in FIGS. **1-3** above in that the bottom plate includes pins **416** for alignment with apertures **406** in the top plate. Additionally, the top and bottom plates **404**, **414** also includes grooves **408**, **413** that cooperate with one another to form channels **410** that receives a catheter shaft or guidewire. In this example, the top plate **404** includes a hinge or a hinge **418** formed as a result of the top plate being made of a flexible and resilient material in a middle section of the top plate between opposite lateral sides **420** of the top plate **404**. Examples may include silicone, polyurethane, etc. The hinge **418** allows either or both lateral sides **420** to be flexed and rotated up and away from the bottom plate **414** to expose the channel **410** formed by the mating grooves **408**, **412** and this allows easy loading, unloading or other manipulation of a guidewire or catheter shaft in the channel **410**. One lateral side **420** may be lifted while the other lateral side remains engaged with the lower plate, or both may be lifted concurrently or sequentially. Other aspects of the device **400** are generally the same as described with respect to FIGS. **1-3**.

FIGS. **5**A-**5**B illustrate another example of a catheter or guidewire management device **500** that is hinged. In FIG. **5**A the top plate **502** is stacked on top of the bottom plate **504**, and the top and bottom plates **502**, **504** may include any of the features of the plates described previously (e.g. grooves, alignment pins, alignment holes, alignment walls, etc.). Here, the top plate **502** is a flat planar plate with a groove **508** disposed on an inner surface of the plate. The bottom plate **504** is also a flat planar plate with a cooperating groove **510** on an inner surface of the plate. When the upper and lower plates **502**, **504** are apposed with one another, the two grooves **508**, **510** cooperate with one another to form a channel **512** that is sized to receive a catheter or guidewire. The size of the channel **512** be may be slightly oversized relative to the catheter or guidewire in order to allow slidable movement of the catheter or guidewire in the channel, or the size may be small enough to pinch the catheter or guidewire and prevent axial movement. A hinge **506** is disposed on a lateral side of the device coupled to the top and bottom plates **502**, **504**. The hinge may be any type of hinge and allows the two plates to pivot relative to one another.

FIG. **5**B shows the device **500** partially opened where the hinged ends of the top and bottom plates remain adjacent one another while the opposite ends of the plates rotate away from one another to allow access to a catheter or guidewire when disposed in the channel **512** formed by the opposing grooves **508**, **510**. Here, a single channel **512** is illustrated however this is not intended to be limiting and multiple grooves may be included to form multiple channels. Also, as discussed, any of the other features in FIGS. **1-3** may be used in conjunction with or substituted for any of the features in FIGS. **5**A-**5**B, for example the alignment pins and holes that receive the pins may also be included in device **500**.

FIGS. **6**A-**6**C illustrate another example of a catheter or guidewire management device that is hinged.

FIG. **6**A shows the bottom plate **602** with two grooves **610**, alignment features **612** such as pins, or apertures for receiving pins, and hinge element **614** in a central portion of the bottom plate. One end **604** of the bottom plate may be curved while the opposite end **608** may be straight. The left and right lateral sides **606** may be straight edges. The grooves **610** may be linear and substantially parallel on one end of the bottom plate and the grooves **610** may diverge away from one another in an arcuate path on the opposite end of the plate. The hinge in this example **614** is a tube that can interdigitate with tubes on the upper plate and then a pin may be inserted through the channel in the tubes to form the hinge which allows independent opening of one half of the upper plate relative to the other half of the upper plate.

FIG. **6**B shows the cooperating top plate **620** that mates with the bottom plate **602** and that also has a hinge elements **622**, **624** along a midline of the upper plate **620** which in this case is two separate plates that are independently movable relative to one another when coupled with hinge **614** on the bottom plate. The upper plate may have a shape that mirrors that of the lower plate and may also include apertures for receiving alignment pins in the lower plate, or the upper plate may have pins that are received in apertures in the lower plate. Also, the upper plate may have grooves which cooperate with the grooves in the lower plate to form channels for receiving a guidewire or catheter. The alignment pins or holes and grooves are not illustrated for convenience. The hinge **622**, **624** are tubular members axially separated from one another so that the hinge **614** from the lower plate may be disposed in the gap between the two upper tubular members and when aligned, a pin may be inserted into the central channel of all the tubes thereby forming the hinge similar to a traditional door hinge. Because the upper plate is split into two halves, each half is therefore configured to be rotated up and down relative to the other half of the top plate independently from one another.

FIG. **6**C shows the upper plate **620** in FIG. **6**B but with the two halves separated from one another. Also, FIG. **6**C shows the two grooves in the top plate that cooperate with the two grooves in the lower plate of FIG. **6**A to form the channels for the catheter or guidewire. Here upper plate **620** includes a left and right lateral side, each with a tubular hinge element **622**, **624**, and that either left, or right or both lateral sides may then be rotated up and toward the midline of the top plate to expose the grooves/channels in the device along with any guidewires or catheters which may be disposed in the channels. Either side may be opened first while the other side remains closed, or both may be opened, or both may be opened concurrently.

In any example of a guidewire or catheter management device, it may be desirable to provide a bracket or other element to facilitate holding or manipulation of the management device by an operator.

FIG. **7**A shows a catheter or guidewire management device **700** with a top plate **702** and a bottom plate **704**

which may be any of the examples disclosed herein, and they may be hingedly coupled together using any of the hinges disclosed herein. The device **700** also includes an annular ring **718** on the bottom plate. Other aspects of the device **700** are similar to other examples previously described above. For example, both upper and lower plates **702**, **704** include grooves **706**, **708** that when opposed form channels **710** for holding a catheter or guidewire. Additionally, the top plate and bottom plate may have alignment pins or holes for receiving the pins to ensure alignment of the top and bottom plates. The annular ring **718** is coupled to the bottom surface of the bottom plate. The ring is sized so that an operator can insert a finger into the annular ring **718** and this helps hold the management device or allows the management device to be easily manipulated. For example, the management device may be rotatable relative to the ring holder thus the operator can still maintain a grasp on the device while rotating the two plates.

FIG. **7**B shows another example of a guidewire or catheter management device **700***a* that is essentially the same as the example in FIG. **7**A but with the major difference being that instead of the annular ring **718**, this device **700***a* includes an expandable and collapsible holding element **720**. The holding element **720** is an accordion type element that is coupled to the bottom surface of the bottom plate **704**. In use the accordion may be extended and when not in use, the accordion may be collapsed onto a smaller configuration. The accordion section may be disposed between two fingers in the operator's hand to allow the operator to hold or otherwise manipulate the management device **700***a*. A larger diameter flanged region **722** provides a stop element and prevents the fingers from sliding past the flanged region. Other aspects of the device **700***a* are generally the same as previously described in FIG. **7**A, For example, the top and bottom plates **702**, **704** may both include grooves **706**, **708** that when apposed with one another form channels **710** for holding a catheter or guidewire. The pins **712** and holes for receiving the pins **714** may be disposed on either the top or bottom plates, and any hinge may be used to couple the two plates together, or no hinge may be used at all.

In any example a bracket or other fixture (not illustrated) may be coupled to the bottom or top plate to allow the management device to be coupled, clipped, or otherwise attached to a surface such as a procedure table.

In any example, the top and/or bottom plates may include color coding, labeling, icons, or other indicia to allow an operator to easily identify which catheter or guidewire is disposed in which groove.

FIGS. **8-13** show an example of another catheter or guidewire management device **800**.

FIG. **8** shows the management device **800** having a lower plate **802** and an upper plate that is formed from two separate upper plate portions **804***a*, **804***b* that pivot independently of one another. The upper plate portions **804***a*, **804***b* are pivotably coupled to the lower plate **802** via hinges **812**. The lower plate includes two grooves **806** that are sized to hold a guidewire or catheter. The grooves **806** on one end of the lower plate are substantially parallel **808** to one another, while on the opposite end the groves flare **810** away from one another. The flared end may face the operator and the parallel grooved end may face the patient, or the opposite orientation may be used where the flared end may face the patient and the parallel grooved end may face the operator. Here, there are two grooves in the bottom plate, and they may be any size but may be greater than 180 degrees of the circumference of the catheter or guidewire but less than 360 degrees. Thus, when a catheter or guidewire is disposed in the groove **806**, a portion is raised above the upper surface lower plate. When the upper plate is closed against the lower plate, the upper and lower plates sandwich the catheter or guidewire holding the catheter or guidewire in position and preventing axial movement. Here, the grooves **808** that are substantially parallel to one another may be distal of the operator and closest to the patient so that the catheters or guidewires enter the patient in substantially parallel direction. The flared grooves **810** may be closest to the operator and prevent entanglement and allow easy separation and identification of the proximal ends of the catheters or guidewires. The lower plate **802** includes alignment holes **816** which are sized to receive the pins **814** protruding out of the lower surface of the top plate **804***a*, **804***b*. The position of the pins and alignment holes may also be reversed or used in any permutation or combination.

The upper plates **804***a*, **804***b* are substantially flat and planar plates with two arms **818** that extend from opposite sides of the upper plates **804***a*, **804***b* on one end of the upper plates **804***a*, **804***b*. These arms **818** receive a pin that protrudes from the sides of the lower plate allowing the upper plates **804***a*, **804***b* to pivot open and closed. When closing, the upper plates pivot inward toward the midline of the lower plate and toward one another, and when opening the upper plates pivot outward away from one another and away from the midline. Both upper plates **804***a*, **804***b* are open in FIG. **8**.

FIG. **9** shows the device **800** seen in FIG. **8**, but this time with the right upper plate **804***b* open, and the left upper plate **804***a* closed thereby obstructing view of the one of the grooves in the lower plate while the other is exposed. Other aspects of FIG. **9** are generally the same as disclosed with respect to FIG. **8**. FIG. **9** also shows that any marking or indicia N may be applied to any portion of the device **800** in order to help an operator identify catheters or guidewires disposed in the grooves.

FIG. **10** shows a side view of the catheter or guidewire management device **800** with both upper plates closed against the lower plate. The view shows the grooves exiting the end of the device in a generally parallel direction relative to one another. Both upper plate portions **804***a*, **804***b* are closed and abut with the lower plate **802**. Other aspects of FIG. **10** are substantially the same as in FIG. **9**.

FIG. **11** shows the same device **800** as in FIG. **10** but is a side view of the device from the end opposite the end seen in FIG. **10**. Thus, in this view the grooves **806** exit the device and flare away from one another. Other aspects of the device **800** in FIG. **11** are generally the same as in FIG. **9** above.

FIG. **12** shows an exploded view of the catheter or guidewire management device **800** shown in FIGS. **8-11** above.

FIG. **13** shows an end view of the catheter or guidewire management device **800** from a lateral end of the device and shows the upper plate **804***b* closed and disposed against the lower plate **802**. Other aspects of FIG. **13** are substantially the same as shown in FIGS. **8-11** above.

Notes and Examples

The following, non-limiting examples, detail certain aspects of the present subject matter to solve the challenges and provide the benefits discussed herein, among others.

Example 1 is a device for management of an elongate shaft, the device comprising: an upper plate; and a lower plate having at least one lower groove disposed therein, the at least one lower groove in the lower plate sized to receive the elongate shaft, wherein the upper plate is releasably

coupled to the lower plate and wherein the elongate shaft is captured between the upper plate and the lower plate.

Example 2 is the device of Example 1, wherein the upper plate further comprises at least one upper groove disposed therein, the at least one upper groove sized to receive the elongate shaft, and wherein the at least one lower groove in the lower plate cooperates with the at least one upper groove in the upper plate to form a channel configured to hold the elongate shaft.

Example 3 is the device of any of Examples 1-2, wherein the elongate shaft is constrained from slidable and rotational movement in the channel when the upper plate is apposed with the lower plate.

Example 4 is the device of any of Examples 1-3, wherein the at least one groove in the upper plate or the lower plate is arcuate.

Example 5 is the device of any of Examples 1-4, further comprising a hinge coupled to the upper and lower plates, wherein the hinge allows the upper plate to be rotated away from the lower plate, thereby allowing access to the at least one lower groove in the lower plate.

Example 6 is the device of any of Examples 1-5, wherein the hinge is coupled to a side of the upper plate and a side of the lower plate.

Example 7 is the device of any of Examples 1-6, wherein the upper plate comprises a first half and a second half, the first and second halves coupled together with a hinge, and wherein the first half is independently rotatable relative to the second half.

Example 8 is the device of any of Examples 1-7, wherein the at least one lower groove in the lower plate comprises a first lower groove disposed therein and a second lower groove disposed therein, wherein the first lower groove is sized to receive the elongate shaft, and wherein the second lower groove is sized to receive a second elongate shaft, and wherein the first half of the upper plate rotates independently of the second half of the upper plate to expose the first lower groove while the second lower groove remains covered by the second half of the upper plate, and wherein the second half of the upper plate rotates independently of the first half of the upper plate to expose the second lower groove while the first lower groove remains covered by the first half of the upper plate.

Example 9 is the device of any of Examples 1-8, wherein the first half of the upper plate rotates inward toward the second half of the upper plate, and wherein the second half of the upper plates rotates inward toward the first half of the upper plate.

Example 10 is the device of any of Examples 1-9, wherein the first half of the upper plate rotates outwardly away from the second half of the upper plate and, wherein the second half of the upper plate rotates outwardly away from the first half of the upper plate.

Example 11 is the device of any of Examples 1-10, further comprising a grasping element coupled to a lower surface of the lower plate, wherein the grasping element is sized and shaped to facilitate grasping and manipulation of the device with an operator's hand.

Example 12 is the device of any of Examples 1-11, wherein the grasping element comprises a ring configured to receive an operator's finger.

Example 13 is the device of any of Examples 1-12, wherein the grasping element is expandable and collapsible between a collapsed configuration and an expanded configuration.

Example 14 is the device of any of Examples 1-13, wherein the lower plate is rotatable relative to the grasping element.

Example 15 is the device of any of Examples 1-14, further comprising one or more pins, wherein the one or more pins are coupled to the upper plate or the lower plate, and wherein the other of the upper plate or the lower plate further comprises one or more apertures for receiving the one or more pins to align the upper and lower plates with one another.

Example 16 is the device of any of Examples 1-15, further comprising a side wall extending from a side of the lower plate, the side wall providing a stop for facilitating alignment of the upper plate with the lower plate and for preventing lateral movement of the upper plate relative to the lower plate.

Example 17 is the device of any of Examples 1-16, wherein the upper plate is formed from a resilient material which permits either a first lateral portion of the upper plate or a second lateral portion of the upper plate opposite the first lateral portion to flex upward and away from the lower plate.

Example 18 is the device of any of Examples 1-17, further comprising indicia on the upper plate or the lower plate to facilitate identification of the elongate shaft disposed in the at least one groove of the lower plate.

Example 19 is the device of any of Examples 1-18, wherein the elongate shaft comprises a guidewire or a catheter shaft.

Example 20 is the device of any of Examples 1-19, wherein the upper plate comprises a first portion and a second portion, wherein the first portion is hingedly coupled with a first end of the lower plate, and the second portion is hingedly coupled with a second end of the lower plate opposite the first end, and wherein the first and second portions open independently away from one another to expose the at least one lower groove in the lower plate.

Example 21 is the device of any of Examples 1-20, wherein the at least one lower groove comprises a first lower groove and a second lower groove disposed in the lower plate, wherein the first and second lower grooves extend from a first edge of the lower plate to a second edge of the lower plate opposite the first edge, and wherein adjacent the first edge the first and second lower grooves are substantially parallel with one another, and wherein adjacent the second edge the first and second lower grooves flare away from one another.

Example 22 is a method for managing an elongate shaft, the method comprising: providing an elongate shaft management device comprising an upper plate and a lower plate; disposing the elongate shaft in a groove in the lower plate; and apposing the upper plate against the lower plate thereby capturing and constraining movement of the elongate shaft therebetween.

Example 23 is the method of Example 22, wherein the upper plate comprises a groove disposed therein, and wherein the groove in the upper plate cooperates with the groove in the lower plate to form a channel for capturing the elongate shaft when the upper plate is apposed with the lower plate.

Example 24 is the method of any of Examples 22-23, further comprising separating the upper plate from the lower plate and manipulating the elongate shaft.

Example 25 is the method of any of Examples 22-24, wherein separating the upper plate from the lower plate comprises hingedly opening the upper plate relative to the

lower plate to provide access to the elongate shaft disposed in the groove of the lower plate.

Example 26 is the method of any of Examples 22-25, wherein separating the upper plate from the lower plate comprises opening a lateral end of the upper plate away from a lateral end of the lower plate.

Example 27 is the method of any of Examples 22-26, wherein the separating the upper plate from the lower plate comprises opening a first side of the upper plate away from the lower plate and towards a center of the lower plate.

Example 28 is the method of any of Examples 22-27, wherein the upper plate comprises a first portion and a second portion, wherein the first portion is hingedly coupled with a first end of the lower plate, and the second portion is hingedly coupled with a second end of the lower plate opposite the first end, and wherein separating the upper plate from the lower plate comprises independently opening the first portion away from the lower plate or independently opening the second portion away from the lower plate, and exposing the groove in the lower plate.

Example 29 is the method of any of Examples 22-28, further comprising disposing a second elongate shaft in a second groove in the lower plate.

Example 30 is the method of any of Examples 22-29, wherein the elongate shaft comprises a guidewire or a catheter shaft.

Example 31 is the method of any of Examples 22-30, wherein the lower plate comprises a side wall extending therefrom, and wherein apposing the upper plate against the lower plate comprises aligning the upper plate with the side wall.

Example 32 is the method of any of Examples 22-31, wherein apposing the upper plate against the lower plate comprises aligning the upper plate with the lower plate by inserting pins extending from the lower plate into cooperating apertures disposed in the upper plate.

Example 33 is the method of any of Examples 22-32, further comprising grasping a grasping element coupled to a lower surface of the lower plate.

Example 34 is the method of any of Examples 22-33, further comprising rotating the management device relative to the grasping element.

Example 35 is the method of any of Examples 22-34, further comprising expanding or collapsing the grasping element between a collapsed configuration and an expanded configuration to provide a surface for grasping.

Example 36 is the method of any of Examples 22-35, wherein grasping the grasping element comprises inserting a finger into a ring coupled to the lower plate.

In Example 37, the apparatuses or methods of any one or any combination of Examples 1-36 can optionally be configured such that all elements or options recited are available to use or select from.

The above detailed description includes references to the accompanying drawings, which form a part of the detailed description. The drawings show, by way of illustration, specific embodiments in which the invention can be practiced. These embodiments are also referred to herein as "examples," Such examples can include elements in addition to those shown or described. However, the present inventors also contemplate examples in which only those elements shown or described are provided. Moreover, the present inventors also contemplate examples using any combination or permutation of those elements shown or described (or one or more aspects thereof), either with respect to a particular example (or one or more aspects thereof), or with respect to other examples (or one or more aspects thereof) shown or described herein.

In the event of inconsistent usages between this document and any documents so incorporated by reference, the usage in this document controls.

In this document, the terms "a" or "an" are used, as is common in patent documents, to include one or more than one, independent of any other instances or usages of "at least one" or "one or more." In this document, the term "or" is used to refer to a nonexclusive or, such that "A or B" includes "A but not B," "B but not A," and "A and B," unless otherwise indicated. In this document, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein." Also, in the following claims, the terms "including" and "comprising" are open-ended, that is, a system, device, article, composition, formulation, or process that includes elements in addition to those listed after such a term in a claim are still deemed to fall within the scope of that claim. Moreover, in the following claims, the terms "first," "second," and "third," etc. are used merely as labels, and are not intended to impose numerical requirements on their objects.

The above description is intended to be illustrative, and not restrictive. For example, the above-described examples (or one or more aspects thereof) may be used in combination with each other. Other embodiments can be used, such as by one of ordinary skill in the art upon reviewing the above description. The Abstract is provided to allow the reader to quickly ascertain the nature of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims. Also, in the above Detailed Description, various features may be grouped together to streamline the disclosure. This should not be interpreted as intending that an unclaimed disclosed feature is essential to any claim. Rather, inventive subject matter may lie in less than all features of a particular disclosed embodiment. Thus, the following claims are hereby incorporated into the Detailed Description as examples or embodiments, with each claim standing on its own as a separate embodiment, and it is contemplated that such embodiments can be combined with each other in various combinations or permutations. The scope of the invention should be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.

The invention claimed is:

1. A device for management of an elongate shaft, the device comprising:

an upper plate disposed in an upper plane; and

a lower plate disposed in a lower plane below the upper plane, having at least one lower groove disposed therein, the at least one lower groove in the lower plate sized to receive the elongate shaft,

wherein the lower groove is disposed in the lower plane and extends therealong,

wherein the lower groove comprises a linear portion and a curved portion, the linear portion and the curved portion disposed in the lower plane and extending therealong,

wherein the upper plate is releasably coupled to the lower plate and wherein the elongate shaft is configured to be captured between the upper plate and the lower plate,

wherein the upper plate comprises a first portion and a second portion, wherein the first portion is hingedly coupled with a first end of the lower plate, and the second portion is hingedly coupled with a second end of the lower plate opposite the first end, and

wherein the first and second portions open independently away from one another to expose the at least one lower groove in the lower plate.

2. The device of claim **1**, wherein the upper plate further comprises at least one upper groove disposed therein, the at least one upper groove sized to receive the elongate shaft, and wherein the at least one lower groove in the lower plate cooperates with the at least one upper groove in the upper plate to form a channel configured to hold the elongate shaft.

3. The device of **2**, wherein the elongate shaft is constrained from slidable and rotational movement in the channel when the upper plate is apposed with the lower plate.

4. The device of claim **2**, wherein the at least one groove in the upper plate is arcuate and the at least one groove in the upper plate is disposed in the upper plane and extends therealong.

5. The device of claim **1**, wherein a hinge is coupled to a side of the upper plate and a side of the lower plate, and wherein the hinge comprises a pin coupled to one of the upper plate or the lower plate and a receptacle for receiving the pin disposed on the other of the upper plate or the lower plate.

6. The device claim **1**, wherein the first portion of the upper plate rotates outwardly away from the second portion of the upper plate and, wherein the second portion of the upper plate rotates outwardly away from the first portion of the upper plate.

7. The device of claim **1**, further comprising a grasping element coupled to a lower surface of the lower plate, wherein the grasping element is sized and shaped to facilitate grasping and manipulation of the device with an operator's hand.

8. The device of claim **7**, wherein the grasping element comprises a ring configured to receive an operator's finger.

9. The device of claim **7**, wherein the grasping element is expandable and collapsible between a collapsed configuration and an expanded configuration.

10. The device of claim **7**, wherein the lower plate is rotatable relative to the grasping element.

11. The device of claim **1**, further comprising one or more pins, wherein the one or more pins are coupled to the upper plate or the lower plate, and wherein the other of the upper plate or the lower plate further comprises one or more apertures for receiving the one or more pins to align the upper and lower plates with one another.

12. The device of claim **1**, further comprising a side wall extending from a side of the lower plate, the side wall providing a stop for facilitating alignment of the upper plate with the lower plate and for preventing lateral movement of the upper plate relative to the lower plate.

13. The device of claim **1**, wherein the upper plate is formed from a resilient material which permits either a first lateral portion of the upper plate or a second lateral portion of the upper plate opposite the first lateral portion to flex upward and away from the lower plate.

14. The device of claim **1**, further comprising indicia on the upper plate or the lower plate to facilitate identification of the elongate shaft disposed in the at least one groove of the lower plate.

15. The device of claim **1**, wherein the elongate shaft comprises a guidewire or a catheter shaft.

16. A device for management of an elongate shaft, the device comprising:

an upper plate disposed in an upper plane; and

a lower plate disposed in a lower plane, having at least one lower groove disposed therein, the at least one lower groove in the lower plate sized to receive the elongate shaft, and wherein the at least one lower groove is disposed in the lower plane and extends therealong,

wherein the upper plate is releasably coupled to the lower plate and wherein the elongate shaft is captured between the upper plate and the lower plate, and

wherein the at least one lower groove comprises a first lower groove and a second lower groove disposed in the lower plate, wherein the first and second lower grooves extend from a first edge of the lower plate to a second edge of the lower plate opposite the first edge, and wherein adjacent the first edge the first and second lower grooves are substantially parallel with one another, and wherein adjacent the second edge the first and second lower grooves flare away from one another in the lower plane.

17. A method for managing an elongate shaft, the method comprising:

providing an elongate shaft management device comprising an upper plate and a lower plate, wherein the upper plate is disposed in an upper plane and the lower plate is disposed in a lower plane;

separating the upper plate from the lower plate and manipulating the elongate shaft,

wherein the upper plate comprises a first portion and a second portion,

wherein the first portion is hingedly coupled with a first end of the lower plate, and the second portion is hingedly coupled with a second end of the lower plate opposite the first end, and wherein separating the upper plate from the lower plate comprises independently opening the first portion away from the lower plate or independently opening the second portion away from the lower plate;

exposing the groove in the lower plate, wherein the groove is curved, the curve disposed in the lower plane and the curve extends along the lower plane;

disposing the elongate shaft in a groove in the lower plate; and

apposing the upper plate against the lower plate thereby capturing and constraining movement of the elongate shaft therebetween.

18. The method of claim **17**, wherein the upper plate comprises a groove disposed therein, and wherein the groove in the upper plate is disposed in the upper plane and extends across the upper plane, and wherein the groove in the upper plate cooperates with the groove in the lower plate to form a channel for capturing the elongate shaft when the upper plate is apposed with the lower plate.

19. The method of claim **17**, wherein separating the upper plate from the lower plate comprises hingedly opening the upper plate relative to the lower plate to provide access to the elongate shaft disposed in the groove of the lower plate.

20. The method of claim **17**, wherein separating the upper plate from the lower plate comprises opening a lateral end of the upper plate away from a lateral end of the lower plate.

21. The method of claim **17**, further comprising disposing a second elongate shaft in a second groove in the lower plate.

22. The method of claim **17**, wherein the elongate shaft comprises a guidewire or a catheter shaft.

23. The method of claim **17**, wherein the lower plate comprises a side wall extending therefrom, and wherein apposing the upper plate against the lower plate comprises aligning the upper plate with the side wall.

24. The method of claim **17**, wherein apposing the upper plate against the lower plate comprises aligning the upper

plate with the lower plate by inserting pins extending from the lower plate into cooperating apertures disposed in the upper plate.

25. The method of claim **17**, further comprising grasping a grasping element coupled to a lower surface of the lower plate.

26. The method of claim **25**, further comprising rotating the management device relative to the grasping element.

27. The method of claim **25**, further comprising expanding or collapsing the grasping element between a collapsed configuration and an expanded configuration to provide a surface for grasping.

28. The method of claim **25**, wherein grasping the grasping element comprises inserting a finger into a ring coupled to the lower plate.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 11,324,925 B2
APPLICATION NO. : 16/997119
DATED : May 10, 2022
INVENTOR(S) : Bourang et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Specification

In Column 1, Line 47, delete “and or” and insert --and/or-- therefor

In Column 1, Line 48, delete “minimally,” and insert --minimally-- therefor

In Column 2, Line 67, delete “lit” and insert --fit-- therefor

In Column 3, Line 17, delete “mate,” and insert --mate.-- therefor

In Column 3, Line 26, delete “408, 413” and insert --408, 412-- therefor

In Column 5, Line 34, delete “7A,” and insert --7A.-- therefor

In Column 5, Line 59, delete “groves” and insert --grooves-- therefor

In Column 9, Line 60, delete ““examples,”” and insert --“examples.”-- therefor

In the Claims

In Column 11, Line 10, in Claim 3, after “of”, insert --claim--

In Column 11, Line 23, in Claim 6, after “device”, insert --of--

Signed and Sealed this
Fourth Day of October, 2022

Katherine Kelly Vidal

Katherine Kelly Vidal
Director of the United States Patent and Trademark Office